Identification guide for the most common bee genera in British Columbia, Canada

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ENGAGING THE WORLD

I dedicate this guide *to the patient instructors of "The Bee Course" run by the American Museum of Natural History, who back in 2002 were kind when this ecologist initially couldn't tell wasps from bees; to Terry Griswold of the Bee Biology and Systematics Laboratory of the USDA for letting me immerse myself in his reference collection on multiple occasions and for his profound patience as I struggled to learn identification to species (Terry, I can't thank you enough for being my teacher); to my amazing and inspiring students who have helped me learn how to teach identification skills to others; and to the countless members of the public whose enthusiasm for bees makes me realize that what I have to offer is worthwhile.*

This guide is not a formal key, but instead a way for a good naturalist to take a stab at figuring out what those amazing creatures visiting flowers might actually be. I wrote it in response to the huge interest in bees that has been growing over the past decade. I meet so many people who want to be able to identify bees and don't know how to begin. Although there are now some books aimed at the general public, they include lots of genera that we don't have here in British Columbia, which can make figuring things out overly difficult.

I was just like many of you, about 15 years ago, when I first started learning about the diversity of our pollinators and took my first tentative steps towards identifying them. I was watching flowers at my research sites on Vancouver Island and realizing that I was seeing different bees on different flowers and in different locations…but I wasn't all that sure what all those bees really were. I figured the way to move my science forward was to figure that out. I think if I knew back then that there are about 450 species of bee in BC I might have been too daunted to even start!

I am still in that "wow isn't that cool?!" place in my bee journey; I wasn't trained as an entomologist but the more I learn about their diversity and their basic biology, the more fascinated I am. My approach may not be typical because my training wasn't typical—for instance, I think it's important to start by looking at the bee's face, because you can often figure out what she is just from that first look (and, well, bees are really cute!). But I figure if it works for me and for training my graduate and undergraduate students, it may work for you. So here are my tips—and I hope they are helpful.

Have fun!

Elizabeth, April 2016

Introduction

This guide is intended to help you to identify many of our wild bees to genus. Based on years of sampling by my lab in Southern BC, the genera included here are the ones that will make up the bulk of most collections. You will no doubt see some other things—but even just being able to say 'well, that really is different' will be an advance! Because some genera are encountered infrequently, it can be easier to learn (for the average naturalist) when they aren't included in an artificial key or guide like this, which is the approach I have taken. If you want to delve deeper, there are other resources to try:

1. This reference, though old, may be the easiest to use to identify bees to genus in our region.
   Stephen, W. P., G. E. Bohart, and P. F. Torchio. 1969. The Biology and external morphology of bees, with a synopsis of the genera of Northwestern America. Oregon State University Agricultural Experiment Station.
   https://catalog.extension.oregonstate.edu/sites/catalog.extension.oregonstate.edu/files/project/pdf/sp001.pdf

2. Although not for our region, and so including some genera we don't have in the West (and missing others), this key has fantastic photos and may be very helpful. Almost all the closeups in this guide are photos from this paper.
   Packer, L., J. A. Genaro, and C. S. Sheffield. 2007. The bee genera of Eastern Canada. Canadian Journal of Arthropod Identification #3. http://cjai.biologicalsurvey.ca/pgs_03/pgs_03.pdf

3. Online resources include Bug Guide (you can submit a photo and experts will attempt identification, www.bugguide.net) and Discover life (with keys to species, but these are not complete for our region, www.discoverlife.org)

There are also two books I recommend. Both are written for the general public, and include all of North America (so include genera we don't have here). They have amazing photos and lots of great information about pollinators, including how to conserve pollinators through planting habitat.

Wilson, J. S. and O. J. Messinger Carril. 2016. The Bees of Your Backyard: A Guide to North America's Bees. Princeton University Press.

Mader, E., M. Shepherd, M. Vaughan, S. Hoffman Black, and G. Lebuhn. 2011. Attracting Native Pollinators, Protecting North America's Bees and Butterflies. Storey Publishing.

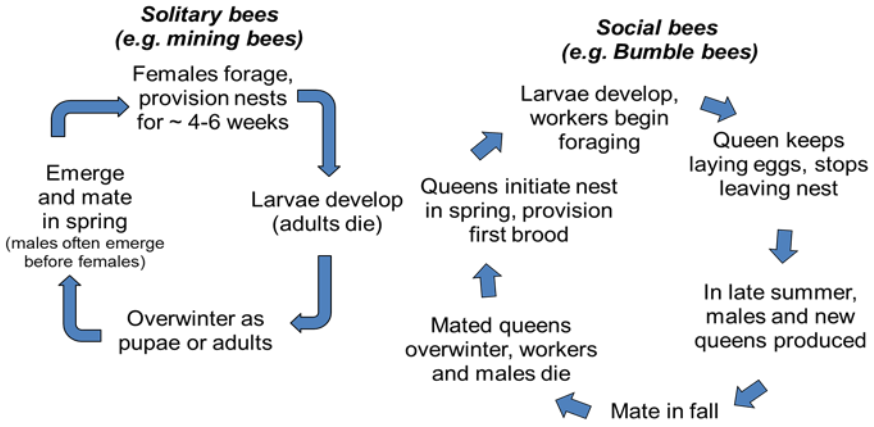
Other than Discover Life (which isn't complete for the West as of this writing), none of these guides include identification to species. There are about 450 species of bee in British Columbia, and insect ID isn't like bird watching (or plant ID, or, frankly, even butterfly ID). You will need a great microscope and lots of intense training to identify bees to species, as it just can't be done "on the wing" or in many cases without a good reference collection checked by an expert. But most people just won't need to know species; you will know quite a lot about a bee if you can figure out her genus!

Bee Natural History

There is information in the sources on page 3 regarding bee natural history, especially well done in the Wilson & Carril book. I can't be comprehensive here, but review a few basic facts that work for our fauna here in BC. The first important thing to know is that most of our species are solitary, not social. That means a single female builds and provisions a nest in which she lays her eggs. In our region, the bumble bees are social species with a queen and workers, and some sweat bees are primitively social with multiple generations a year, but all the others are making a living on their own.

Most of our diversity is active in spring (which is when our wild plants flower), and solitary species only have one generation a year. Any given solitary species is only active for 4-6 weeks, so the bees you see in March are going to be different species (even if in the same genus) than those you see in May.

Typical Life Cycles:



Bees are "central place foragers" meaning they forage in a radius around their nest, like birds do. The distance they fly looking for food (pollen and nectar) is highly correlated with their body size, with small bees only flying 50-100 m, while large bumble bees may fly 1-2 km. Different kinds of bees nest in different substrates. Most of our mining (Andrenidae) and sweat (Halictidae) bees nest in the ground. Most of our hairy-belly bees (Megachilidae) nest in existing cavities in wood (for instance, beetle bore holes). The common bumble bees in our region nest in existing cavities below ground (like abandoned mouse holes, or the 'air pockets' that can form in compost piles or loose soil), but some nest near the surface of the ground, such as in bunchgrasses, or even well above ground such as in an abandoned chickadee nest box. What all this means is, if you can figure out in general what kind of bee you are looking at, you will probably know something about its nest requirements, and based on its size you will have an idea of where she is nesting.

If you are concerned about pollinator declines, well, that is a very complicated issue. But the best available data around wild pollinator conservation suggests that the main reason for declines is loss of habitat, mostly because we convert it to human use like agriculture. If you want to help the bees, the best thing you can do is plant a garden. For information on pollinator-attractive plants in our region, please see my web page: www.sfu.ca/biology/faculty/elle/bee_info.html

Getting Started With ID!

Please note: Unless otherwise indicated, the images used in this guide are from the fabulous Eastern Genera key by Packer, Genaro, and Sheffield 2007 (reference and link on page 3), and sometimes from draft versions of this key. I have tried to use my own images or those of my students when available, and to clearly attribute ownership of all other images used here. All rights reside with the original photographers. Disclaimer: not all images are of local species!

To make this reasonably approachable I have used simple characters, those I would use when teaching a new student in my lab to do a first "rough sort" of a collection. They aren't necessarily the ones you'd find in a proper scientific key. If you go in for more advanced ID using some of the resources on page 3, you will definitely need to start learning proper terminology. And of course the characters won't work if you are in the wrong part of the key. But hopefully this guide can get you started!

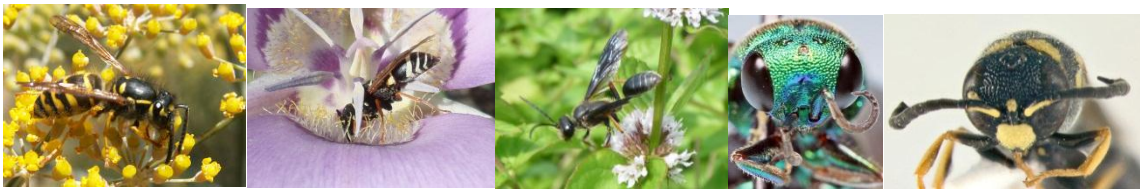
Step 1: is it a bee?

Coming from a background in ecology, not entomology, I initially had some difficulty distinguishing bees from other insects, especially insects that mimic bees, including some flies and wasps. I learned that the best thing to do if you have an insect "in the hand" is to look at the face. There is a gestalt to a bee, and it differs from flies and wasps!

Flies have two wings and bees have four. Flies also have relatively short antennae, and usually larger eyes than bees do (bug eyes!).

L to R: Beefly, bulbfly, dronefly, flower fly, flower fly face. Note the large eyes and short antennae on the flower fly face. All photos E. Elle except face closeup by USGS.

Wasps are closely related to bees so can sometimes be hard to distinguish from them. They will have four wings, like bees. They tend to have less, and more silver-coloured, hair than bees. Some have the distinctive 'wasp waist', and many have their antennae inserted fairly low on the face. They will not have pollen transport structures.



L to R: wasps by D. Ditchburn (dereilanatureinn.ca), S. Elwell, and E. Elle; Chrysidid face by D. Almquist (bug guide) and Vespid face MJ Hatfield (bug guide). Note the low placement of the antennae on the face closeups.

Step 2: is it a female?

Most of the bees you see will be female and they have important characteristics males don't, like scopae (hairs or structures for pollen transport). The characters I use in this guide apply to females, but don't always apply to males, who don't have scopae (or stings!) and sometimes differ in other aspects of structure or colour. To tell the sexes apart, males have one extra antennal segment (13 rather than 12, you will need a microscope to count them) and (usually) a moustache—yellow hair or markings on the face.

All males on the right of each male/female pair, photos E. Elle. Clockwise from top left: *Bombus*, *Megachile*, *Andrena*, *Eucera*. And aren't these faces cuter than the wasps and flies on the previous page?

Step 3: sort your bees into four basic groups; either set males aside or put them where you think they fit best!

Group 1: fairly large/hairy with scopae (pollen transport area) on the hind leg (mostly Apidae), **page 7**

Group 2: bees with scopae under the abdomen, variable in size and colour (Megachilidae), **page 9**

Group 3: other, mostly mid-sized bees (definitely a mixed bag! Members of Andrenidae, Halictidae, and Colletidae will go here), **page 12**

Group 4: tiny bees (usually less than 5 mm in length), **page 15**

GROUP 1: large, fairly hairy bees (probably Apidae, in our region), with scopae (pollen transport areas) on their hind legs.

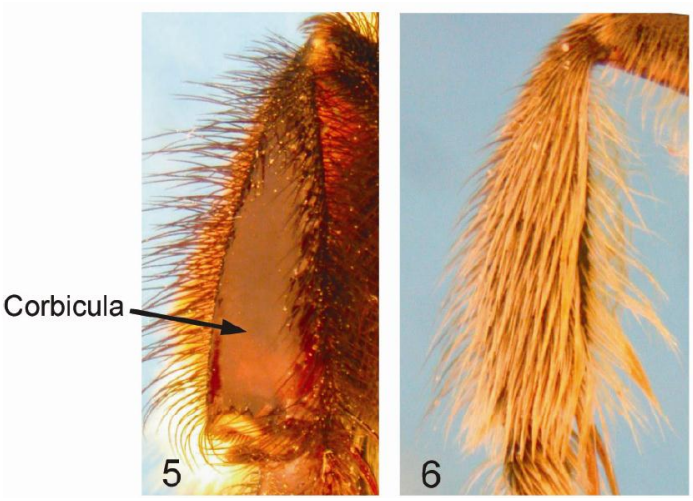
L to R: Bumble bee, honey bee, and *Anthophora*, all photos by E. Elle

Honey bees: have hairy eyes, and have no spurs on the tibia of their hind leg (most bees have two spurs).

Packer et al. 2007

Honeybee with hairy eye, photo S. McCann

Bumble bees: you probably recognize these right away. Large and hairy, in shades of yellow, black, and orange. They have a corbicula, a concave shiny area lined with strong hairs, on the rear leg (if female).



Packer et al. 2007

Other large fuzzy Apidae: Some bees look like bumble bees but they have no corbicula (see figure left), just a very hairy back leg for pollen transport. Some of these bees have very long antennae (especially the males). In profile, the lower face (the clypeus) often projects (figure right). Because of the way they used to be classified, these bees are sometimes collectively called the "Anthophorids".

Packer et al. 2007

http://entnemdept.ifas.ufl.edu/

In our region these bees are not very abundant, but they are striking so you may notice them! There are several genera including (L to R below) *Eucera*, *Melissodes*, *Anthophora* (by S. Scott, C. Hutton, H. Wisch, bugguide). Long antennae on males may give you an idea why one common name is "long horned bee".

GROUP 2: Megachilidae (hairy belly bees)

Female bees of non-parasitic species have their scopa on the underside of the abdomen (the hairy belly!). Bees in this family tend to be very robust, with head, thorax, and abdomen all fairly wide. They also generally have jaws with many teeth, used in constructing their nests. Hairy belly bees are cavity nesters and use mud, resins, plant hairs, leaves, and other materials to make their nests. We have two common genera and many uncommon ones.

L to R, all photos E. Elle: *Osmia*, *Megachile*, and *Anthidium* (note yellow markings). Notice how all these bees have rounded bodies with head, thorax, and abdomen all similarly wide.

Scopa of stiff hairs under the abdomen to transport pollen. Images left from Packer et al. 2007, image right by E. Elle.

Impressive jaws on an *Osmia*, to transport nest construction materials. (H. Go, Discover Life)

What kind of hairy-belly bee do you have?

1. Does the bee have bright yellow or white markings on the integument (look at the *Anthidium* picture on the previous page)? If yes, go to *Anthidium* and *Dianthidium* (#4). If not, go to 2.
2. Is your bee non-metallic, often with hair bands on abdomen, and missing the ariola (the little flap) between claws? Are her parapsidial lines linear? (see figures below). **If yes, she is a *Megachile*.**
3. Is your bee metallic, with an ariola, and with punctiform (looking like round punctures) marks on the thorax (figures below)? **She is an *Osmia*.**
4. Does your brightly marked bee have an ariola? **If yes, she is a *Dianthidium*; if no, an *Anthidium*.**

Ariola absent (left) and present (right)


Parapsidial lines on thorax punctiform (left) vs. linear (right). Packer et al. 2007.

There are several other genera in the Megachilidae, most of them dark or black, sometimes with hair bands, sometimes metallic, and all with toothed jaws and (unless parasitic) the scopa under the abdomen. None are very common making it fun when you see one. You may at first assume they are *Megachile* but the ones you are likely to encounter in southern BC will all have an ariola.

Left to Right: *Hoplitis* (R. S. Bernard, bugguide), *Heriades* (G. McDonald, bugguide), *Chelostoma* (KC Wildlife, bugguide).

Two genera of nest parasites are sometimes encountered.

Coelioxys: these bees are nest parasites on *Megachile*. They look like *Megachile* but with no scopa and a pointy end on their abdomen. They also have spines on the back of their thorax.

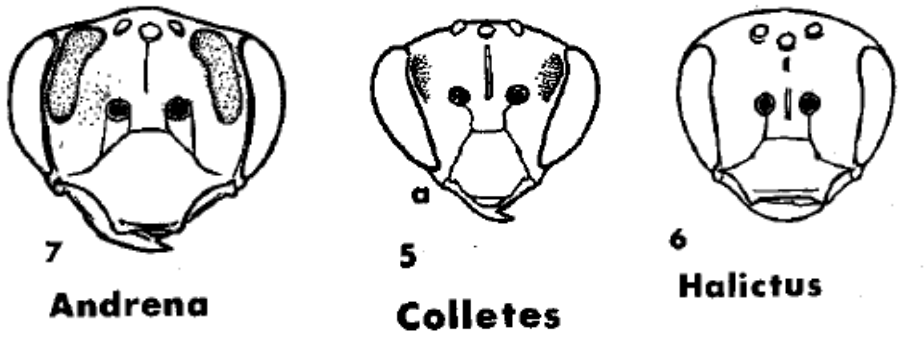
Stelis are nest parasites of *Osmia*, and look a lot like *Osmia* with stripes in the integument.

Coelioxys (left and centre, note pointed abdomen, E. Elle) and *Stelis* (right, A. Williams, bugguide)

GROUP 3: The vast remainder (other than tiny bees, see Group 4)

Most of the bees that you will see will be in this "catch-all" group, which mostly includes species in the mining (Andrenidae) and sweat bee (Halictidae) families, but also some plasterer bees (Colletidae). These families are diverse and abundant in our region, and generally dig their own nests in the ground. One thing they share is a relatively slender body shape (compared to Bumble bees and the hairy-belly bees). Most will have scopae on their rear legs and sometimes on the back of their thorax as well (near their 'waist').

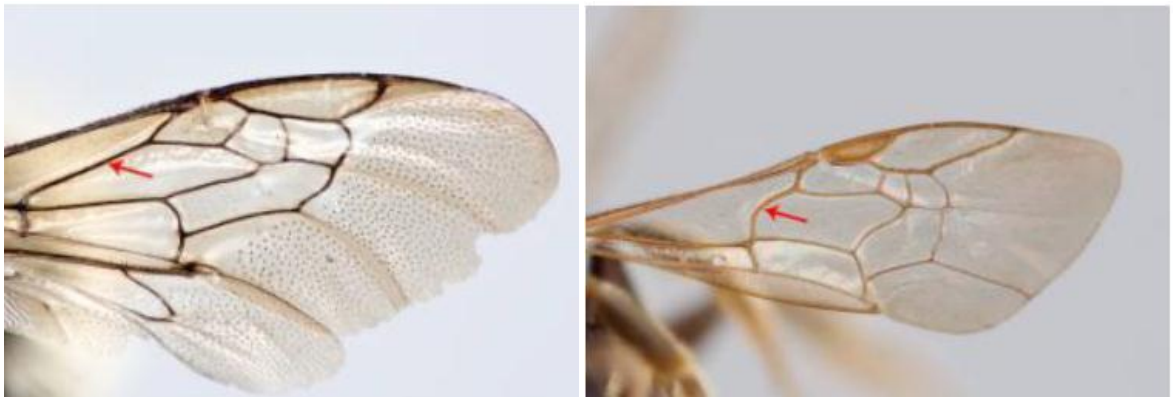
1. Does the bee have a broad, somewhat heart-shaped head, with facial fovea (kidney-bean shaped "dents" on the face, to the inside of the eyes, see figure)? (note: males in this group don't have facial fovea). If yes, then:
    a. Does she have an S-shaped second recurrent vein (see figure next page)? She is a *Colletes*. (not very common)
    b. Does she have a 'normal' second recurrent vein, and a relatively straight basal vein? She is an *Andrena* (very diverse in our region, mostly active in spring)



Drawings from Stephen, Borchart, & Torchio 1969. Fovea on *Andrena* and *Colletes* but not *Halictus*.

L to R: *Andrena* with facial fovea (www.extension.org), and *Colletes* (E. Elle)

Colletes: second recurrent vein looks like an "S" on the right wing (figure left), vs. a straight vein (right)



A straight basal vein (left), compared to one with a strong curve (right; in my lab we call this the 'hockey stick').

2. Does your bee have a triangular head shape with no facial fovea (see *Halictus* diagram, previous page), and a curved basal vein (the hockey stick, figure above)? She is in the Halictidae, a sweat bee.
    a. Bright metallic green bees, at least on head and thorax, *Agapostemon*
    b. Apical hair bands on the abdomen (see figure), *Halictus*
    c. Basal hair bands (or no obvious bands) on the abdomen, *Lasioglossum*

Packer et al. 2007

Halictus (left) with apical hair bands, and *Lasioglossum* (right) with basal hair bands. On older bees, some of the hair may have rubbed off. Apical bands look like fringe on the edge of the abdominal segment, whereas basal bands look like they are coming out from beneath the previous segment (to help you remember, think basal = beneath).

L to R: *Agapostemon* (S. Elwell), *Lasioglossum* (J. Wray), and *Halictus* (M. Hart).

Note that tiny bees (Group 4) can also be *Halictus* or *Lasioglossum*, and the same traits apply!

There are some other sweat bee genera in our region, notably *Sphecodes*, which have the triangular sweat bee face and hockey stick vein, and a red abdomen. They also have no scopa on the legs as they are nest parasites on other bees. They tend to be small—you might initially keep them in with the 'tiny bee' group.

Sphecodes, from www.nathistoc.bio.uci.edu

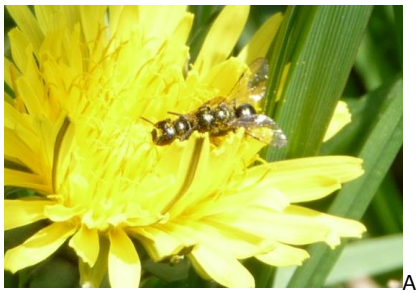
One other red (or sometimes red and yellow) bee is in the Apidae, not the Halictidae. *Nomada* are very wasp-like, and are nest parasites on *Andrena*, so if you are seeing *Andrena*, you may see these.

Left: E. Elle. Right: T. Bentley bugguide

GROUP 4: the tiny bees—those less than a half centimeter long.

This group is considered separately just because they are so small—usually just 4-5 mm. They really do need magnification to appreciate, and it's only over time that you might be able to tell the difference without a microscope. This very artificial group includes bees in the Apidae, Halictidae, Colletidae, and Andrenidae.

1. *Ceratina*: in the Apidae (yes, these tiny bees are relatives of bumble bees!). They are very round-looking, metallic bees. They have a round face with yellow on the clypeus. We notice that they tend to be straight ("bum up") on the pin, and appear rounder and shinier/more metallic than others in this category.


A mating pair (E. Elle)

2. Sweat bees have tiny versions. Look for the triangular face and the hockey stick vein (remember, always check the face first!). Some are metallic, some are not. As before, *Halictus* has apical hair bands, and *Lasioglossum has* no or basal hair bands. On the pin, the abdomen tends to hang downward, giving them a very different look from *Ceratina*.




Left to Right: *Lasioglossum* S. Elwell; *Lasioglossum* E. Elle (this bee is on Bacopa, a garden plant—flowers just 1 cm across!), *Halictus* L. Neame (on a squash flower, which gives you an idea of how tiny she is).

1. *Hylaeus*: in the Colletidae. Although some can be larger than 0.5 cm, the most common species in our region are small. These slender black bees have distinctive yellow or white markings on their faces, which is why they have the common name 'masked bees'.


L to R: S. Cresswell and C. Pegg (bugguide)

You may initially put various other bees here when sorting, because they are too small to easily put into another group until you view them with magnification. So, look for all the same characters as before, such as location of the scopa, the shape of the basal vein, and the shape and contours of the face. There are very small *Andrena* (subgenus Micrandrena), a few tiny *Osmia* or other Megachilidae, and other bees may initially wind up here, but if you look at the main characters in this guide you should be able to place them!